

REMARKS

The present application was filed on November 24, 1999 with claims 1-20. Claims 1 through 20 are presently pending in the above-identified patent application.

The present invention is directed to a method and apparatus for detection of persons or other objects of interest in a video signal or other type of image signal. In accordance with an illustrative embodiment of the invention, a processing system generates, e.g., a threshold difference image by processing an image signal received from a camera. The difference image is then segmented into regions bounded by lines, such as vertical lines, passing through the image, and silhouette candidates are identified in one or more of the regions. Tensor voting is used to determine saliency values and corresponding tangents for each of the silhouette candidates, and the resulting values and tangents are used to detect the object of interest.

In the Office Action, the Examiner rejected Claims 1-5, 9-13 and 18-20 under 35 U.S.C. §103(a) as being unpatentable over the combination of Courtney (United States Patent No. 5,969,755), and Abe (United States Patent No. 5,134,472). The Examiner also rejected Claims 6 and 14 under 35 U.S.C. §103(a) as being unpatentable over Courtney and Abe, in further view of the article entitled "Grouping into Regions, Curves, and Junctions" by Lee et al. and rejected Claims 7, 8, and 15-17 under 35 U.S.C. §103(a) as being unpatentable over Courtney and Abe, in further view of Gibbon (E.P. Patent No. 0 635 983 A2).

Independent Claims 1, 9, and 20

The Examiner rejected independent Claims 1, 9, and 20 under 35 U.S.C. §103(a) as being unpatentable over the

combination of Courtney.

In the previous Office Action, the Examiner asserted that, referring to claim 1, Courtney discloses a method for detecting an object of interest in an image processing system.

- 5 The Examiner further asserted that Courtney discloses the step of segmenting the difference image into a plurality of regions (citing col. 6, lines 27-31 and Figure 7f), but fails to teach that the difference image is segmented into a plurality of regions such that each of the regions are bounded by one or more
10 lines passing through the entire image. The Examiner asserted, however, that segmenting images into a plurality of regions such that each of the regions are bounded by one or more lines passing through the entire image was exceedingly well known in the art (for example, by Abe).

- 15 In that Office Action, Applicant noted that the vertical segments cited by the Examiner are vertical segments within a pointing window, not an entire image.

- In the current Office Action, the Examiner maintains that "the window as taught by Abe, appears to be an entire
20 image."

- Applicant notes that, even if the window taught by Abe is considered to be an "entire image," the vertical segments taught by Abe are not utilized for detecting an object of interest in an image processing system. Abe teaches the
25 "details of how the CPU eliminates the boundary between the object and the background" by utilizing the vertical segments illustrated in FIGS. 11 and 12. Col. 10, lines 59-61. At this point in the process, the object of interest has already been detected, as is apparent in FIGS. 10, 11, and 12.

Moreover, even if the method taught by Abe to eliminate the boundary between the object and background is considered to be a method to detect an object of interest, the order of the steps in the method taught by Abe teach away from
5 the order of the steps in the present invention. For example, claim 1 recites segmenting the difference image into a plurality of regions, identifying one or more silhouette candidates in at least a subset of the regions, and detecting the object of interest based at least in part on the identified silhouettes.
10 Thus, the object of interest is detected from the silhouettes that are identified from silhouette candidates in a plurality of regions. The plurality of regions are created (segmented) prior to identifying the silhouettes. Clearly, Abe teaches that the segmentation of FIGS. 11 and 12 occurs after the identification
15 of the silhouettes of FIG. 10.

Thus, Courtney and Abe, alone or in combination, do not disclose or suggest segmenting the difference image into a plurality of regions, wherein the difference image is segmented into a plurality of regions such that each of the regions are
20 bounded by one or more lines passing through the entire image;

identifying one or more silhouette candidates in at least a subset of the regions; and

detecting the object of interest based at least in part on the identified, as required by each of the independent
25 claims.

Additional Cited References

The Examiner has also cited Lee et al., "Grouping into Regions, Curves, and Junctions" for its disclosure of the determination of saliency values using tensor voting. Lee et
30 al. does not disclose or suggest "segmenting the difference

image into a plurality of regions, wherein the difference image is segmented into a plurality of regions such that each of the regions are bounded by one or more lines passing through the entire image," as required by each of the independent claims.

- 5 The Examiner has also cited Gibbon (E.P. Patent No. 0 635 983 A2) for its disclosure of the step of detecting a neck position of a moving person by analyzing the sum of x-components of tangents along a corresponding silhouette. Gibbon does not disclose or suggest "segmenting the difference image into a
- 10 plurality of regions, wherein the difference image is segmented into a plurality of regions such that each of the regions are bounded by one or more lines passing through the entire image," as required by each of the independent claims.

Dependent Claims 2-8 and 10-19

The Examiner rejected dependent Claims 2-5, 10-13 and 18-19 under 35 U.S.C. Section 102(e) as being anticipated by Courtney, rejected Claims 6 and 14 under 35 U.S.C. §103(a) as being unpatentable over Courtney and Abe, in further view of the article entitled "Grouping into Regions, Curves, and Junctions" by Lee et al. and rejected Claims 7, 8, and 15-17 under 35 U.S.C. §103(a) as being unpatentable over Courtney and Abe, in further view of Gibbon.

Claims 2-8 and 10-19 are dependent on independent Claims 1 and 9, respectively, and are therefore patentably distinguished over Courtney, Abe, Lee, and Gibbon (alone or in any combination) because of their dependency from amended independent Claims 1 and 9 for the reasons set forth above, as well as other elements these claims add in combination to their base claim.

In view of the foregoing, Applicant respectfully submits that the present application is in condition for allowance.

Early and favorable action is earnestly solicited.

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Respectfully submitted,

By Kevin M. Mason

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Kevin M. Mason
Attorney for Applicant
(203) 255-6560
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CERTIFICATE OF FACSIMILE TRANSMISSION

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It is hereby certified that this correspondence is being transmitted via facsimile to Examiner Chong R. Kim of the U.S. Patent and Trademark Office at 703-872-9314 on the date indicated below.

On September 16, 2003

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By Kevin M. Mason

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